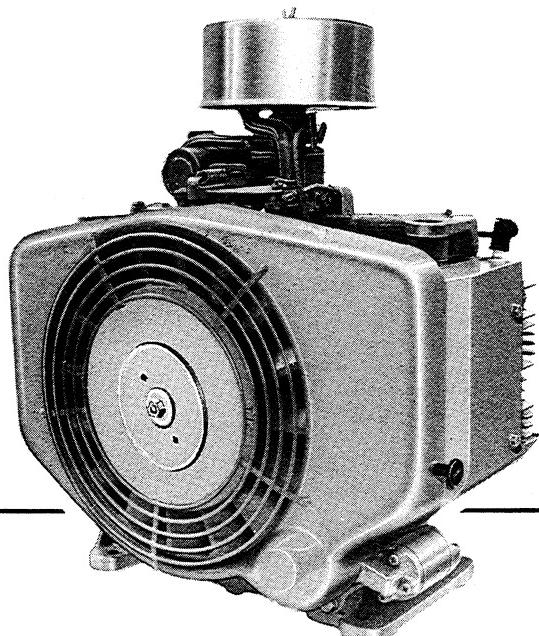


**Onan**

# **Operators Manual**

**CCK  
CCKA  
Engines**



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**927-0153  
SPEC J  
7-85  
Printed in U.S.A.**

# Safety Precautions

It is recommended that you read your engine manual and become thoroughly acquainted with your equipment before you start the engine.

**DANGER** *This symbol if used warns of immediate hazards which will result in severe personal injury or death.*

**WARNING** *This symbol refers to a hazard or unsafe practice which can result in severe personal injury or death.*

**CAUTION** *This symbol refers to a hazard or unsafe practice which can result in personal injury or product or property damage.*

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that can result in serious, personal injury. Take care in following these recommended procedures.

## Safety Codes

- All local, state and federal codes should be consulted and complied with.
- This engine is not designed or intended for use in aircraft. Any such use is at the owner's sole risk.

## General

- Provide appropriate fire extinguishers and install them in convenient locations. Use an extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the engine are secure and accurately torqued. Keep guards in position over fans, driving belts, etc.
- If it is necessary to make adjustments while the engine is running, use extreme caution when close to hot exhausts, moving parts, etc.

## Protect Against Moving Parts

- Do not wear loose clothing in the vicinity of moving parts, such as PTO shafts, flywheels, blowers, couplings, fans, belts, etc.
- Keep your hands away from moving parts.

## Batteries

- Before starting work on the engine, disconnect batteries to prevent inadvertent starting of the engine.
- DO NOT SMOKE while servicing batteries. Lead acid batteries give off a highly explosive hydrogen gas which can be ignited by flame, electrical arcing or by smoking.
- Verify battery polarity before connecting battery cables. Connect negative cable last.

## Fuel System

- DO NOT fill fuel tanks while engine is running.
- DO NOT smoke or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel lines must be of steel piping, adequately secured, and free from leaks. Piping at the engine should be approved flexible line. Do not use copper piping for flexible lines as copper will work harden and become brittle enough to break.
- Be sure all fuel supplies have a positive shutoff valve.

## Exhaust System

- Exhaust products of any internal combustion engine are toxic and can cause injury, or death if inhaled. All engine applications, especially those within a confined area, should be equipped with an exhaust system to discharge gases to the outside atmosphere.
- Do not use exhaust gases to heat a compartment.
- Make sure that your exhaust system is free of leaks. Ensure that exhaust manifolds are secure and are not warped by bolts unevenly torqued.

## Exhaust Gas is Deadly!

Exhaust gases contain carbon monoxide, a poisonous gas that can cause unconsciousness and death. It is an odorless and colorless gas formed during combustion of hydrocarbon fuels. Symptoms of carbon monoxide poisoning are:

- |                           |                        |
|---------------------------|------------------------|
| • Dizziness               | • Vomiting             |
| • Headache                | • Muscular Twitching   |
| • Weakness and Sleepiness | • Throbbing in Temples |

If you experience any of these symptoms, get out into fresh air immediately, shut down the unit and do not use until it has been inspected.

The best protection against carbon monoxide inhalation is proper installation and regular, frequent inspections of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

## Cooling System

- Coolants under pressure have a higher boiling point than water. DO NOT open a radiator pressure cap when coolant temperature is above 212°F (100°C) or while engine is running.

## Keep the Unit and Surrounding Area Clean

- Make sure that oily rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and present a potential fire hazard.

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***INCORRECT SERVICE OR REPLACEMENT OF PARTS CAN RESULT IN SEVERE PERSONAL INJURY AND/OR EQUIPMENT DAMAGE. SERVICE PERSONNEL MUST BE QUALIFIED TO PERFORM ELECTRICAL AND/OR MECHANICAL SERVICE.***

# Introduction

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## KNOW YOUR ENGINE

Read this manual carefully, observing all **WARNINGS** and **CAUTIONS**. Operating instructions, adjustments and periodic maintenance procedures are given so you . . . the owner, can keep your unit running like new and expect many years of dependable service from it. Remember . . . any machine, regardless of design or type, will perform only in relation to the service it receives. Regularly scheduled maintenance lowers operating costs.

## ENGINE MODEL REFERENCE

Identify your model by referring to the **MODEL** and **SPEC** (specification) **NO.** as shown on the unit nameplate. Always use this number and the engine serial number when making reference to your engine.

If a major repair or an overhaul is necessary, Onan recommends that a competent mechanic either do the job or supervise and check the work of the mechanic assigned to do the job to ensure that all dimensions, clearances and torque values are within the specified tolerances.

**An engine service manual and complete parts catalog are available at additional cost. Contact your nearest authorized dealer or Onan Parts and Service Center.**

## REFERENCE MANUALS

Parts Catalog .....	927-0253
Major Service Manual .....	927-0754

These instructions contain the SI metric equivalents following immediately in parentheses after the U.S. customary units of measure.

## SPECIFICATIONS

Engine Design .....	Opposed two cylinder, four cycle, and air cooled
Bore .....	3.25 inch (82.55 mm)
Stroke .....	3.00 inch (76.2 mm)
Displacement .....	49 CID (803 cm <sup>3</sup> )
Horsepower - CCK (2700 RPM) .....	12.9 BHP (9.6 kW)
Horsepower - CCKA (3600 RPM) .....	16.5 BHP (12.3 kW)
Oil Capacity <sup>1</sup> .....	3.0 qt (2.8 litre)
Oil Capacity with filter change <sup>1</sup> .....	3.5 qt (3.3 litre)
Compression Ratio - CCK .....	5.5 to 1
Compression Ratio - CCKA .....	7.0 to 1

<sup>1</sup> - Add 0.5 quart (0.47 litre) for electric start models.

### TUNE-UP SPECIFICATIONS

Spark Plug Gap - Gasoline .....	0.025 inch (0.635 mm)
Spark Plug Gap - Gas .....	0.018 inch (0.457 mm)
Breaker Point Gap .....	0.020 inch (0.51 mm)
Tappets (Cold) Intake .....	0.006 to 0.008 inch (0.152 to 0.203 mm)
Exhaust .....	0.015 to 0.017 inch (0.381 to 0.432 mm)

Engine Timing (Engine Running)	CCK	*CCKA
Manual Start .....	19° BTC	24° BTC
Electric Start .....	19° BTC	24° BTC
Electric Start (No Advance) .....		20° BTC
Electric Start (Magneto Ignition) .....		24° BTC
Engine Timing (Static Setting)		
Manual Start .....	19° BTC	1° ATC
Electric Start .....	19° BTC	1° ATC
Electric Start .....		20° BTC
Electric Start (Magneto Ignition) .....		5° BTC

\* - With spark advance unless otherwise noted.

# Engine Set-Up

Inspect the engine visually. Check for loose or missing parts and any damage that may have occurred in shipment.

**CAUTION** *Oil and fuel have been drained from the engine prior to shipping from Onan. Severe engine damage will result if engine is started without oil.*

## BATTERIES

The batteries and battery cables used for starting the engine should be of sufficient size to provide prompt starting. Undersized batteries will result in poor starter operation and a very short starter service life.

**WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke while servicing batteries.*

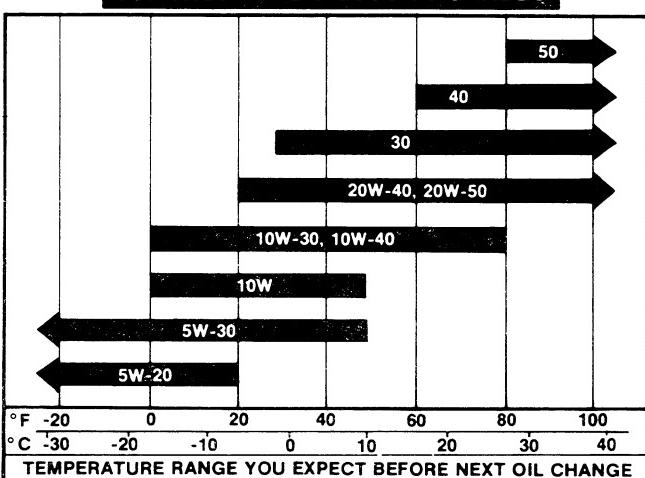
## CRANKCASE OIL RECOMMENDATIONS

Fill crankcase with correct amount of oil. Refer to SPECIFICATIONS for crankcase capacity. Use oils meeting the American Petroleum Institute (API) classification SE or SE/CC.

**WARNING** *Crankcase pressure can blow out hot oil and cause serious burns. Do NOT check oil while the engine is operating.*

**CAUTION** *Do not overfill crankcase. Excess oil causes higher operating temperatures and may cause foaming.*

### USE THESE SAE VISCOSITY GRADES



## Oil Level

Check oil level at least every 8 hours of operation. Check more frequently on a new or reconditioned engine as oil consumption is higher until the piston rings seat properly.

When adding oil between oil changes, it is preferable to use the same brand, as various brands of oil may not be compatible together. Refer to MAINTENANCE section for recommended oil change intervals and procedures.

## FUEL RECOMMENDATIONS

**WARNING** *Ignition of fuel can cause serious personal injury or death by fire or explosion. Do not permit any flame, cigarette, or other igniter near the fuel system.*

Use clean, fresh, unleaded gasoline. Regular leaded gasoline may also be used but is not a preferred fuel. Do not use highly leaded premium gasoline. Use of unleaded gasoline results in less maintenance.

**CAUTION** *Do not use gasoline de-icers. Gasoline de-icers can cause internal damage to carburetor and fuel pump parts. Do not use fuels containing alcohol concentrations greater than ten percent. Fuel containing alcohol may cause poor engine performance and internal engine damage.*

If regular leaded gasoline is used continually, carbon and lead deposits should be removed from the cylinder heads as required because of engine power loss. Unleaded gasoline may be used safely after lead deposits have been removed.

**WARNING** *Spilled fuel can ignite and cause serious personal injury or death. Never fill the fuel tank when the engine is running.*

## EXHAUST SYSTEM

Exhaust products of any internal combustion engine are toxic and can cause injury, or death if inhaled. All engine applications, especially those within a confined area, should be equipped with an exhaust system to discharge gases to the outside atmosphere.

**WARNING** *Inhalation of exhaust gases can result in serious personal injury or death. Use extreme care during installation to ensure a tight exhaust system.*

# Operation

## STARTING

Most engines are equipped with a start-stop switch and cable controlled choke and throttle.

1. Place the throttle control in the *SLOW* position and the choke into the *FULL* choke position.
2. Turn the ignition switch on and engage starter. If engine fails to start after 30 seconds determine the cause. Wait one minute before recranking.  
*If the engine fails to start at first attempt, rust inhibitor oil used at the factory may have fouled the plugs. Remove the plugs, clean in a suitable solvent, dry thoroughly and reinstall. Heavy exhaust smoke when the engine is initially started is normal and usually caused by rust inhibitor oil.*
3. When the engine starts, gradually push the choke lever in until the engine runs smoothly.
4. Black smoke from the exhaust and a rough running engine usually indicate over-choking.
5. To stop the engine, turn the ignition switch to the *OFF* position.

## BREAK-IN PROCEDURE

Controlled break-in is the ideal fitting of all internal moving metal parts. Using the proper oil and applying a conscientious maintenance program during this period helps assure satisfactory service from your Onan engine.

Maintain the proper cooling and lubrication during break-in. Run the engine at half load for the first three hours with intermittent periods of full load to control engine break-in.

**CAUTION** *Using the wrong grade and weight of oil and high engine operating temperatures during break-in can cause engine damage.*

Check the oil level at least every five operating hours. Add oil to keep it at the proper level, but never overfill as overfilling may cause the oil to foam and enter the breather system.

## HOT WEATHER OPERATION

When operating the engine in temperatures above 100°F (38°C), pay particular attention to the following items to prevent damage:

1. Keep the engine cooling fins clean and free of obstruction.

**CAUTION** *Plugged or clogged cooling fins can cause overheating and engine damage.*

### **WARNING**

*Contact with rotating machinery can cause serious personal injury or death. Stay clear of rotating components and ensure that protective shields and guards are in place and secured before operating machinery.*

2. See that nothing obstructs air flow to and from the engine.
3. Ensure that you are using the proper grade and weight of oil for ambient temperatures. Check the oil level each time you fill the fuel tank.
4. Check the battery water more frequently than every 50 hours which is recommended under normal conditions. High temperatures cause faster evaporation.
5. Change crankcase oil and filter more frequently than recommended under normal conditions.

## COLD WEATHER OPERATION

When the engine is being used in temperatures below 32°F (0°C), check the following items closely:

1. Use the correct grade and weight of oil for the temperature conditions. Change the oil only when the engine is warm. If an unexpected temperature drop occurs when the engine is filled with summer oil, before starting the engine, move it to a warm location until the oil will flow freely.
2. Use fresh fuel. Fill the fuel tank after each day's use to protect against moisture condensation.
3. Keep the battery in a well- charged condition.

## DUST AND DIRT

1. Keep unit clean. Keep cooling system clean.
2. Service air cleaner as frequently as required.
3. Change crankcase oil and filter more often than recommended under normal conditions.

## OUT-OF-SERVICE PROTECTION

Protect an engine that will be out-of-service for more than 30 days as follows:

1. Run the engine until it reaches normal operating temperature.
2. Turn off the fuel supply and run the engine until it stops.
3. Drain oil from oil base while the engine is still warm. Refill with fresh crankcase oil and attach a tag stating viscosity used.

4. Remove spark plugs. Pour 1 ounce (2 tablespoons or 28 grams) of rust inhibitor or SAE #50 oil into the cylinders. Crank the engine over a few times. Reinstall spark plugs.
5. Service air cleaner as outlined in *MAINTENANCE* section.
6. Clean governor linkage and protect by wrapping with a clean cloth.
7. Plug exhaust outlet to prevent entrance of moisture, dirt, bugs, etc.
8. Wipe entire unit. Coat rustable parts with a light film of grease or oil.
9. Provide a suitable cover for the entire unit.
10. If battery equipped, disconnect and follow standard battery storage procedure.

## **RETURNING UNIT TO SERVICE**

1. Remove cover and all protective wrapping. Remove plug from exhaust outlet.
2. Check tag on oil base and verify that oil viscosity is still correct for existing ambient temperatures.
3. Clean and check battery. Measure specific gravity (1.260 at 77°F [25°C]) and verify level to be at split ring. If specific gravity is low, charge until correct value is obtained. If the level is low, add distilled water and charge until specific gravity is correct.
4. Check that fuel filter and fuel lines are secure, with no leaks.
5. Check carburetor, adjust if necessary.
6. Connect battery.
7. Start Engine.

**After engine has started, excessive blue smoke is exhausted until the rust inhibitor has burned away.**

## **WARNING**

### **EXHAUST GAS IS DEADLY!**

***Exhaust gases contain carbon monoxide, a poisonous gas that can cause unconsciousness and death. It is an odorless and colorless gas formed during combustion of hydrocarbon fuels. Symptoms of carbon monoxide poisoning are:***

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>● <b>Dizziness</b></li> <li>● <b>Headache</b></li> <li>● <b>Weakness and Sleepiness</b></li> </ul> | <ul style="list-style-type: none"> <li>● <b>Vomiting</b></li> <li>● <b>Muscular Twitching</b></li> <li>● <b>Throbbing in Temples</b></li> </ul> |
|---|---|

***If you experience any of these symptoms, get out into fresh air immediately, shut down the unit and do not use until it has been inspected.***

***The best protection against carbon monoxide inhalation is proper installation and regular, frequent inspections of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.***

# Maintenance

## WARNING

*Accidental starting of the engine can cause severe personal injury or death.*

*Disconnect the battery cable when repairs are made to the engine, controls panel, or associated equipment.*

## DAILY CHECKS OR EVERY 8 HOURS

The operator should daily make a complete visual and audible inspection of the engine. Check the following before starting the engine for the first time each day:

1. Check all fuel lines and fittings for possible leakage.
2. Inspect exhaust system for possible leakage and cracks. Locate leaks in muffler and piping while the engine is operating. Repair all leaks immediately after they are detected for personnel safety.
3. Inspect air cleaner system for leaks. Make certain that all clamps and fittings are tight and free of potential leaks.
4. Check crankcase oil level with the engine off. If oil level is at or below "add" mark on dipstick (Figure 1), add sufficient oil of the proper viscosity as specified in the *ENGINE SET-UP* section to bring oil level to the full mark on the dipstick. Do not operate engine with oil level below the "add" mark.

**Allow a minimum of 10 minutes for the oil to drain down before checking. The best time to check the oil is after an overnight shut-down period.**

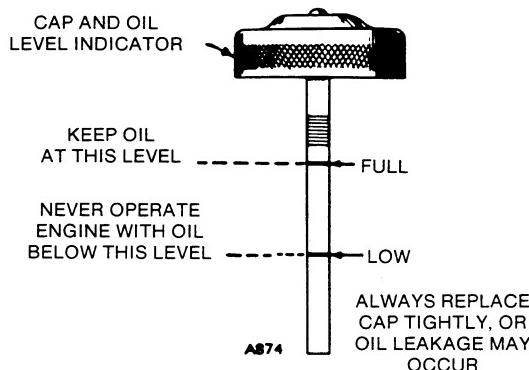


FIGURE 1. CRANKCASE OIL FILL

## OIL CHANGE

Change crankcase oil after the first 25 hours of operation. Thereafter change crankcase oil every 100 hours on engines equipped with oil filter and every 50 hours on engines without oil filter. If operating in extremely dusty, high ambient, or low ambient conditions change oil more often.

Run engine until thoroughly warm before draining oil. Stop the engine, place a pan under the drain outlet and remove the oil drain plug or open the drain valve. After the oil is completely drained, replace the drain plug or close the drain valve. Refill with oil of the correct API classification and appropriate SAE viscosity grade for the temperature conditions (refer to *ENGINE SET-UP* section).

## WARNING

*Hot crankcase oil can cause burns if it is spilled or splashed on skin. Keep fingers and hands clear when removing the oil drain plug and wear protective clothing.*

Oil level should be to the "full" mark of the dipstick. Start engine and run for a short time to check for oil leaks around the drain plug.

## OIL FILTER CHANGE

Replace oil filter (Figure 2) after the first 25 hours of operation, and every 100 hours thereafter. If operating in extremely dusty, high ambient, or low ambient conditions change oil filter more often.

Spin off oil filter element and discard it. Thoroughly clean filter mounting surface and install new element, making sure new gasket is inserted in the element. Apply a thin film of oil to the gasket. Spin element down by hand until gasket just touches mounting pad and then turn down an additional 1/4-1/2 turn. Do not overtighten.

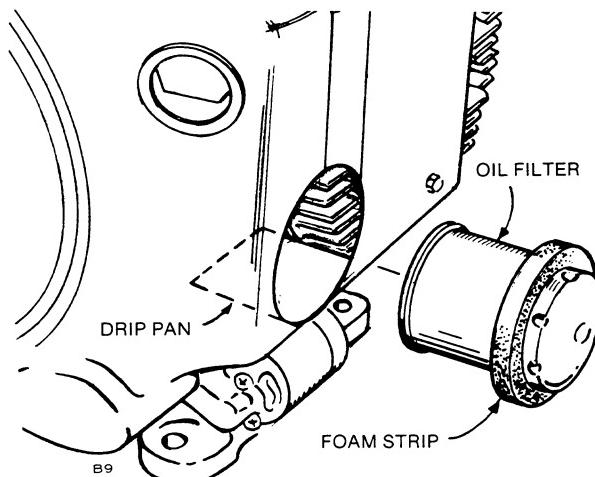


FIGURE 2. OIL FILTER (OPTIONAL)

With oil in crankcase, start engine and check for leaks around filter element. Retighten only as much as necessary to eliminate leaks, but do not overtighten.

## IGNITION

### Spark Plugs

Check, and regap spark plugs every 100 hours of operation (Figure 3). Replace spark plugs that show signs of fouling or electrode erosion.

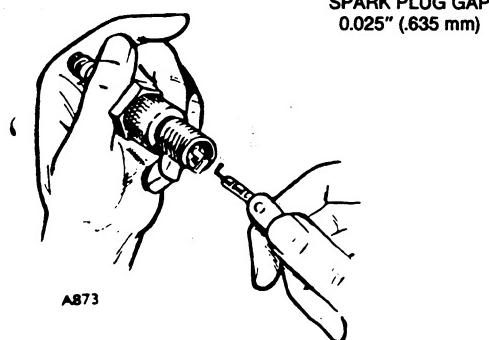


FIGURE 3. SPARK PLUG GAP

### Breaker Points

Check breaker points every 100 hours. Replace points and condenser every 200 operating hours. Replace sooner if points are pitted or burned. See ADJUSTMENTS section.

## COOLING SYSTEM

Check and clean cooling fins and chaff screen at least every 50 hours. Remove any dust, dirt or oil which may have accumulated.

## BATTERIES

Disconnect negative ground strap from the battery before working on any part of the electrical system or engine.

Disconnect positive terminals before charging batteries to avoid damaging alternator or regulator.

**WARNING** *Ignition of explosive battery gases can cause severe personal injury. Do not smoke while servicing batteries.*

### Cleaning Batteries

Keep the batteries clean by wiping them with a damp cloth whenever dirt appears excessive.

If corrosion is present around the terminal connections, remove battery cables and wash the terminals with an ammonia solution or a solution consisting of 1/4 pound of baking soda added to 1 quart of water.

Be sure the vent plugs are tight to prevent cleaning solution from entering the cells.

After cleaning, flush the outside of the battery, the battery compartment, and surrounding areas with clear water.

Keep the battery terminals clean and tight. After making connections, coat the terminals with a light application of petroleum jelly or non-conductive grease to retard corrosion.

### Checking Specific Gravity

Use a battery hydrometer to check the specific gravity of the electrolyte in each battery cell.

Hold the hydrometer vertical and take the reading. Correct the reading by adding four gravity points (0.004) for every five degrees the electrolyte temperature is above 80° F (27°C) or subtracting four gravity points for every five degrees below 80° F (27°C). A fully charged battery will have a corrected specific gravity of 1.260. Charge the battery if the reading is below 1.215.

### Checking Electrolyte Level

Check the level of the electrolyte (acid and water solution) in the batteries at least every 50 hours of operation.

Fill the battery cells to the bottom of the filler neck. If cells are low on water, add distilled water and recharge. If one cell is low, check case for leaks. Keep the battery case clean and dry. An accumulation of moisture will lead to a more rapid discharge and battery failure.

**CAUTION**

*Do not add water in freezing weather unless the engine is to be run long enough (two or three hours) to assure a thorough mixing of water and electrolyte.*

### Storing Batteries

If the engine is to be stored for more than 30 days, remove the batteries. With the electrolyte level at the bottom of the splitting ring, charge the battery before storing it. After every 30 days the battery is in storage, bring it back up to full charge. To reduce self-discharge, store the battery in as cool a place as possible so long as the electrolyte does not freeze.

## CRANKCASE BREATHER

This engine uses a crankcase breather valve for maintaining crankcase vacuum. If the crankcase becomes pressurized as evidenced by oil leaks at the seals, clean valve in a suitable solvent. Check and clean valve screens and baffle every 200 hours of operation. See Figure 4.

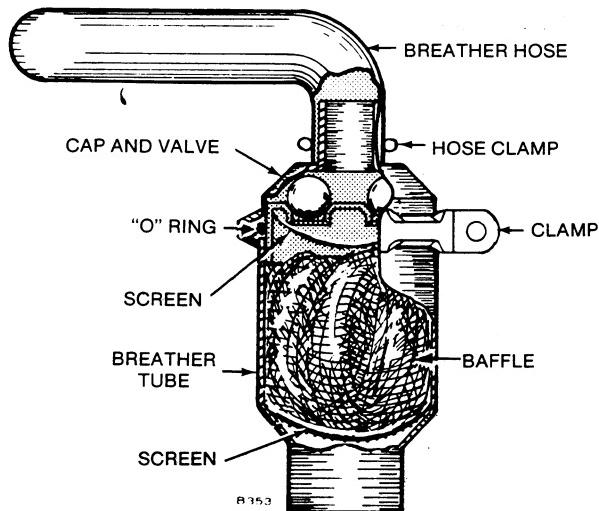


FIGURE 4. CRANKCASE BREATHER

## AIR CLEANER

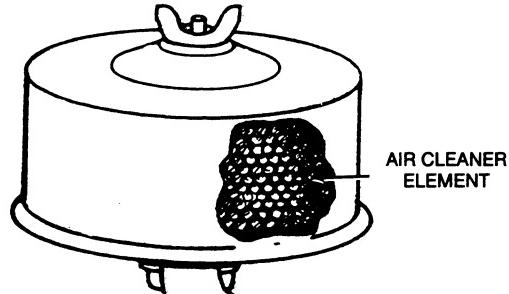
### Cartridge Air Cleaner

Check and clean air cleaner element every 25 hours (Figure 5). Clean by gently tapping element on a flat surface. Replace the element every 200 hours. Clean or replace more frequently in dusty operating conditions.

### Air Cleaner Wrapper (Pre-Cleaner [if used])

Wash in water and detergent and squeeze dry like a sponge (Figure 5). Allow to dry, then coat evenly with two tablespoons (28 grams) of SAE 30 engine oil. Knead into and wring excess oil from pre-cleaner. Reinstall over cartridge.

**Failure to adequately wring out excess oil from the wrapper may cause drop in engine horsepower due to an increased restriction of inlet air.**



1. WASH
2. SQUEEZE DRY
3. COAT WITH OIL
4. INSTALL OVER PAPER ELEMENT



## EXHAUST SYSTEM

Make regular visible and audible inspections of the exhaust system throughout the entire life of the engine. Locate leaks in muffler and piping while the engine is operating. Repair all leaks immediately after they are detected for personnel safety.

**WARNING** *Inhalation of exhaust gases can result in serious personal injury or death. Inspect exhaust system audibly and visually for leaks daily. Repair any leaks immediately.*

FIGURE 5. AIR CLEANER ASSEMBLY

## PERIODIC MAINTENANCE SCHEDULE

Follow a regular schedule of inspection and servicing, based on operating hours (see *Periodic Maintenance Schedule*). Keep an accurate logbook of maintenance, servicing, and operating time. Use the factory recommended Periodic Maintenance Schedule (based on favorable operating conditions) to serve as a guide to get long and efficient engine life. Regular service periods are recommended for normal service and

operating conditions. For continuous duty, extreme temperature, etc., service more frequently. For infrequent use, light duty, etc., service periods can be lengthened accordingly. Neglecting routine maintenance can result in engine failure or permanent damage.

For any abnormalities in operation, unusual noises from the engine or accessories, loss of power, overheating, etc., contact your nearest Onan Service Center.

## PERIODIC MAINTENANCE SCHEDULE

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS				
	8	25	50	100	200
Inspect Engine Generally	X <sup>1</sup>				
Check Oil Level	X				
Service Air Cleaner		X <sup>2</sup>			
Change Crankcase Oil (with Filter)		X <sup>3</sup>		X <sup>2</sup>	
Change Crankcase Oil (without Filter)		X <sup>3</sup>	X <sup>2</sup>		
Check Battery Electrolyte Level			X		
Clean Cooling Fins			X <sup>2</sup>		
Replace Oil Filter		X <sup>3</sup>		X <sup>2</sup>	
Check or Replace Spark Plugs				X	
Check Breaker Points				X	
Replace Points and Condenser					X
Clean Breather Valve					X <sup>2</sup>
Replace Air Cleaner Element					X <sup>2</sup>
Check Valve Clearance			X <sup>3</sup>		X <sup>4</sup>
Compression Check					X <sup>4</sup>
Clean Carbon and Lead Deposits (Cylinder Head)					X <sup>4,5</sup>

X<sup>1</sup> - Check for fuel leaks. With engine running, visually and audibly check exhaust system for leaks.

X<sup>2</sup> - Perform more often when running under severe operating conditions.

X<sup>3</sup> - Initial break-in check only.

X<sup>4</sup> - For detailed maintenance, contact an Onan Service Center or refer to the 927-0754 SERVICE MANUAL.

X<sup>5</sup> - For engines running on unleaded fuel this interval may be extended to 400 hours.



*Inhalation of exhaust gases can result in serious personal injury or death.*

**Do NOT use the air cleaner or exhaust elbow as a supporting step. Damage to these and connecting parts might cause an exhaust leak.**

# Adjustments

## MARVEL SCHEBLER CARBURETOR

The carburetor idle and main mixture screws were set for maximum efficiency at the factory and should normally not be disturbed. If adjustments seem necessary, first be sure the ignition system is working properly and is not the source of the problem.

If adjustment is needed, proceed as follows:

1. Turn both mixture screws (Figure 6) in until lightly seated, then back the idle mixture screw out 1-1/8 turns and the main mixture screw out 1-1/4 turns.

**CAUTION** *Forcing the mixture adjustment screws tight will damage the needle and seat. Turn in only until light tension can be felt.*

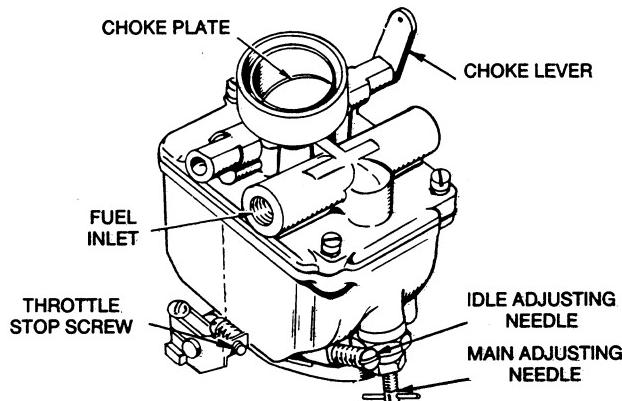


FIGURE 6. CARBURETOR ADJUSTMENTS

**WARNING** *T-handled main adjustment screws are locked in position with a packing nut. This nut must be loosened before adjustments are made and retightened afterward. Failure to tighten the packing nut may result in leaking fuel, creating a serious fire hazard.*

2. Start the engine and allow it to warm up thoroughly (at least 10 minutes).

Some equipment manufacturers may require higher throttle stop speed and governor low speed rpm settings. Refer to equipment manufacturer's Operator's Manual for the correct rpm settings.

3. Move the engine speed control to the slow position.
4. Pull the governor back so the *THROTTLE* stop screw is against its stop. Continue to hold the governor arm in this position while completing the adjustments described in step 5.

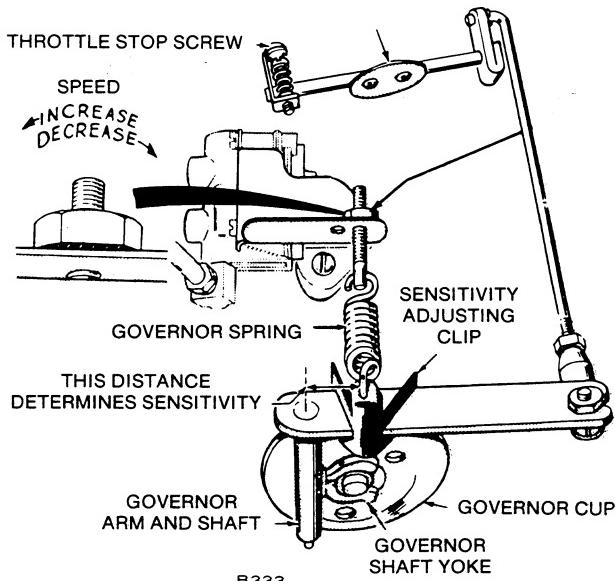


FIGURE 7. GOVERNOR SPEED ADJUSTMENT

5. Turn the *IDLE* adjustment screw, *IN* until engine speed drops and then *OUT* until engine speed drops again. Over a narrow range between these two settings, engine speed will be at its maximum. Set the idle adjustment screw about 1/8 turn outward from the midpoint of this range.
6. Check the main mixture adjustment by rapidly accelerating the engine from idle to full. The engine should accelerate evenly and without hesitation. If it does not, turn the main adjustment screw out in 1/8 turn increments until the engine accelerates smoothly, but do not turn it out more than 1/2 turn beyond the original setting.

## BREAKER POINTS

The timing is adjusted during initial engine assembly and is fixed by the point gap adjustment. To maintain maximum engine efficiency, change the breaker points every 200 hours of operation.

### Replacement and Adjustment

1. Remove spark plugs.
2. Remove breaker box cover. Rotate crankshaft clockwise (facing flywheel) until points are fully open.
3. Remove two mounting screws (A) and pull point set out of box just far enough so screw (B) can be removed. See Figure 8. Replace points and condenser set. Do not completely tighten mounting screws (A).
4. Adjust point gap by rotating crankshaft clockwise (facing flywheel) by hand until the points are fully open. Set the point gap (using flat feeler gauge) at 0.020 inch (0.51 mm) by adjusting screw (C).

**Make sure feeler gauge is clean and free of any grease, oil or dirt.**

5. Tighten mounting screws (A) and recheck point gap. Place one drop of oil on breaker point pivot.

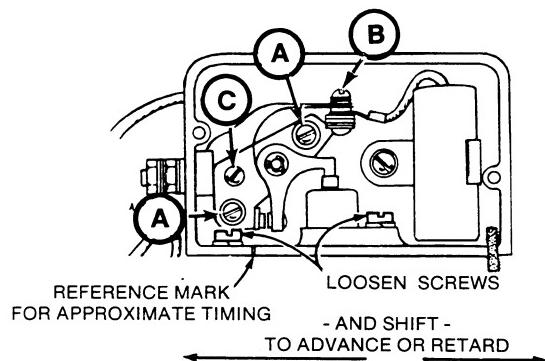


FIGURE 8. SETTING POINT GAP

6. Replace breaker box cover, coil wire, spark plugs, and spark plug cables.

### Continuity Test

As a check for proper ignition timing a continuity test may be performed:

1. Adjust breaker points.
2. Remove blower housing to expose timing marks on top of gearcase cover and flywheel (Figure 9).

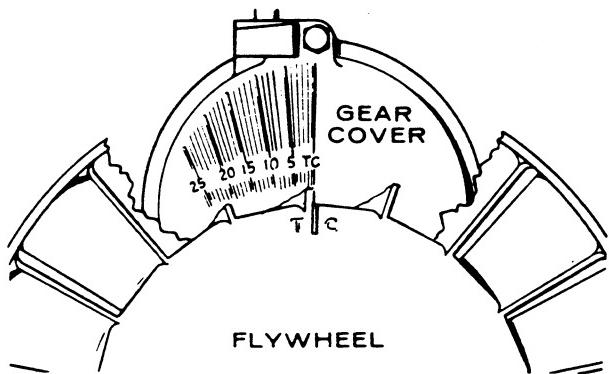


FIGURE 9. TIMING MARKS

3. Rotate flywheel clockwise until timing mark is aligned with the mark corresponding to timing specifications.
4. Connect an ohmmeter or a continuity test lamp set across the ignition breaker points. Touch one test prod to the coil lead terminal (screw B Figure 9).
5. Touch the other test prod to a good ground on the engine.
6. Turn crankshaft against rotation (counterclockwise) until the points close. Then slowly turn the crankshaft with rotation (clockwise).
7. The lamp should go out or continuity is lost just as the points break, which is where ignition occurs. If timing is early (advanced) the point gap is too large. If timing is late (retarded) the point gap is too small. Adjust point gap accordingly.





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